



MAUL FOSTER ALONGI

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June 15, 2010
Project No. 8128.01.08

Mr. Dana Bayuk
Oregon Department of Environmental Quality
2020 SW 4th Avenue
Portland, Oregon

Re: Monthly Progress Report – May 2010
Siltronic Corporation
7200 NW Front Avenue, Portland, OR
ECSI #183

Dear Dana:

Maul Foster & Alongi, Inc. (MFA) has prepared this progress report (Report) in accordance with the requirements of the *Order Requiring Remedial Investigation (RI) and Source Control Measures* (the Order), Oregon Department of Environmental Quality (DEQ) No. VC-NWR-03-16, issued to Siltronic Corporation (Siltronic) on February 9, 2004. The reporting period for this Report is May 1, 2010, through May 31, 2010. The next report is due July 10, 2010.

The report organization follows that of the previous progress reports.

ACTIONS TAKEN UNDER THE ORDER SINCE THE PREVIOUS PROGRESS REPORT

Fieldwork

The fourteenth round of sampling for the Group 3 performance monitoring wells (PMWs) was completed during May. Quarterly and semi-annual groundwater samples were collected from the remaining riverbank wells during May.

Monthly water levels were collected on May 19, 2010, as shown on Table 1.¹

Measurements of dense, non-aqueous phase liquid (DNAPL) from former manufactured gas plant (MGP) operations were collected in selected Group 1 and 2 PMWs on May 19, 2010. DNAPL was not detected in the PMWs with one exception. MGP DNAPL was estimated (based upon staining on the bailer only) in WS-33-81 (approximate MGP DNAPL thickness: 0.75 ft), and a sample was collected and submitted for analysis consistent with previous MGP DNAPL sampling.

¹ Table includes monthly water levels from January through April 2010; water levels from preceding years have previously been submitted.

Actions to Be Taken in the Next Two Months

Groundwater elevations and DNAPL thickness measurements will be collected in June and July.

Performance monitoring in the Group 1, 2, and 3 wells will continue in June.

In the coming months, MFA anticipates submitting ongoing performance monitoring data collected consistent with the reporting protocol pending DEQ approval of the revised Performance Monitoring Plan (PMP). Siltronic and its representatives anticipate meeting with DEQ to discuss DEQ comments regarding the revised PMP and the Contingency Monitoring Plan (CMP).

TEST RESULTS AND DATA RECEIVED SINCE THE PREVIOUS PROGRESS REPORT

MFA has received the preliminary results of the fifteenth round of samples from Group 3 PMWs. Data through the fourteenth round of Group 3 sampling were evaluated consistent with DEQ comments regarding trend evaluation and consistent with the revised PMP. The trend evaluation and summary statistics are included in a separate data submittal memorandum attached to this report.

The attached (electronic only) MS Excel data file contains all PMW and quarterly monitoring data received and validated through the end of the reporting period.

As noted previously, RAO 1 for the source area has been met in all of the Group 1 and 2 PMWs.

PROBLEMS EXPERIENCED SINCE THE PREVIOUS PROGRESS REPORT

No additional problems were experienced since the previous progress report.


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Please call either of us at (971) 544-2139 if you have questions or comments.

Sincerely,

Maul Foster & Alongi, Inc.



James G.D. Peale, RG
Senior Hydrogeologist



Ted Wall, PE
Director of Engineering

Attachment: Table 1
PMW Data received through May 31, 2010 (MS Excel – electronic only)
Data Submittal Memorandum

cc: Tom McCue, Siltronic Corporation (electronic and hard copy)
Alan Gladstone, Davis Rothwell Earle and Xochihua (electronic and hard copy)
Chris Reive, Jordan Schrader Ramis (electronic and hard copy)
Jim Anderson, DEQ (electronic)
Kristine Koch, EPA (electronic)
Sean Sheldrake, EPA Seattle (electronic)
Rene Fuentes, EPA Seattle (electronic)
Eric Blischke, EPA Portland (electronic)
Chip Humphrey, EPA Portland (electronic)
Lance Peterson, CDM (electronic)
Bob Wyatt, NW Natural (electronic)
Patty Dost, Pearl Legal Group LLC (electronic)
John Edwards, Anchor QEA LLC (electronic)
Carl Stivers, Anchor QEA LLC (electronic)
Rob Ede, Hahn and Associates, Inc. (electronic)
Tom Gainer, DEQ (electronic)
Henning Larsen, DEQ (electronic)
Matt McClincy, DEQ (electronic)

Portland, Oregon

PERIOD: From 01/18/2010 thru 05/19/2010 - Inclusive

[illegible]

Portland, Oregon

PERIOD: From 01/18/2010 thru 05/19/2010 - Inclusive

[illegible]

Table 1
Groundwater Elevations and Willamette River Stage
January 2010 - May 2010
Siltronic Corporation
Portland, Oregon

PERIOD: From 01/18/2010 thru 05/19/2010 - Inclusive

[illegible]

Portland, Oregon

PERIOD: From 01/18/2010 thru 05/19/2010 - Inclusive

SITE	DATE	MP ELEVATION (feet)	TIME	DEPTH TO WATER (feet)	DELTA WATER ELEV (feet)	WATER ELEV. (feet)
WS-23-116	1/18/2010	32.49	11:07	23.78	NA	8.71
WS-23-116	2/15/2010	32.49	10:01	26.11	-2.33	6.38
WS-23-116	3/23/2010	32.49	10:36	27.06	-0.95	5.43
WS-23-116	4/12/2010	32.49	10:32	26.71	0.35	5.78
WS-23-116	5/19/2010	32.49	9:23	24.05	2.66	8.44
WS-24-111	1/18/2010	33.73	10:53	24.99	NA	8.74
WS-24-111	2/15/2010	33.73	9:57	27.31	-2.32	6.42
WS-24-111	3/23/2010	33.73	10:30	28.47	-1.16	5.26
WS-24-111	4/12/2010	33.73	10:28	27.87	0.60	5.86
WS-24-111	5/19/2010	33.73	9:18	25.41	2.46	8.32
WS-24-126	1/18/2010	33.76	10:51	25.03	NA	8.73
WS-24-126	2/15/2010	33.76	9:55	27.35	-2.32	6.41
WS-24-126	3/23/2010	33.76	10:29	28.39	-1.04	5.37
WS-24-126	4/12/2010	33.76	10:27	27.93	0.46	5.83
WS-24-126	5/19/2010	33.76	9:16	25.38	2.55	8.38
WS-24-155	1/18/2010	33.75	10:55	35.86	NA	- 2.11
WS-24-155	2/15/2010	33.75	9:58	39.16	-3.30	- 5.41
WS-24-155	3/23/2010	33.75	10:27	41.21	-2.05	- 7.46
WS-24-155	4/12/2010	33.75	10:30	39.95	1.26	- 6.20
WS-24-155	5/19/2010	33.75	9:15	36.70	3.25	- 2.95
WS-25-111	1/18/2010	34.01	10:40	25.20	NA	8.81
WS-25-111	2/15/2010	34.01	9:45	27.50	-2.30	6.51
WS-25-111	3/23/2010	34.01	10:17	28.69	-1.19	5.32
WS-25-111	4/12/2010	34.01	10:19	28.06	0.63	5.95
WS-25-111	5/19/2010	34.01	9:05	25.63	2.43	8.38
WS-25-96	1/18/2010	34.13	10:42	25.25	NA	8.88
WS-25-96	2/15/2010	34.13	9:46	27.53	-2.28	6.60
WS-25-96	3/23/2010	34.13	10:19	28.77	-1.24	5.36
WS-25-96	4/12/2010	34.13	10:20	28.08	0.69	6.05
WS-25-96	5/19/2010	34.13	9:07	25.70	2.38	8.43
WS-26-116	1/18/2010	33.56	10:36	24.66	NA	8.90
WS-26-116	2/15/2010	33.56	9:40	26.96	-2.30	6.60
WS-26-116	3/23/2010	33.56	10:14	28.25	-1.29	5.31
WS-26-116	4/12/2010	33.56	10:15	27.52	0.73	6.04
WS-26-116	5/19/2010	33.56	9:02	25.15	2.37	8.41
WS-26-86	1/18/2010	33.32	10:38	24.53	NA	8.79
WS-26-86	2/15/2010	33.32	9:42	26.80	-2.27	6.52
WS-26-86	3/23/2010	33.32	10:15	28.01	-1.21	5.31
WS-26-86	4/12/2010	33.32	10:17	27.35	0.66	5.97
WS-26-86	5/19/2010	33.32	9:03	24.97	2.38	8.35

MP - Measuring Point
Elevations in feet relative to MSL (NGVD 29)

Table 1
Groundwater Elevations and Willamette River Stage
January 2010 - May 2010
Siltronic Corporation
Portland, Oregon

PERIOD: From 01/18/2010 thru 05/19/2010 - Inclusive

[illegible]

Portland, Oregon

PERIOD: From 01/18/2010 thru 05/19/2010 - Inclusive

[illegible]

Portland, Oregon

PERIOD: From 01/18/2010 thru 05/19/2010 - Inclusive


[illegible]



MEMORANDUM

To: Mr. Dana Bayuk – Oregon DEQ Date: June 15, 2010

From: James G.D. Peale, RG Project: 8128.01.20



RE: Enhanced *In Situ* Bioremediation (EIB) Performance Monitoring Data Submittal
Data Received through May 31, 2010
Siltronic Corporation – ECSI #183

The following summarizes data and trends from the EIB performance monitoring wells (PMWs) using data received through May 31, 2010. The data include results from the 14 Group 3 sampling events completed through May 2010. No additional Group 1 and 2 data have been received since the previous memorandum submitted May 13, 2010. The previous data memorandum included observations based on data through April 2010; these observations are still valid, and are updated here as needed.

In its February 4, 2010 letter, the Oregon Department of Environmental Quality (DEQ) approved using a variety of summary statistics and other trend analysis techniques for the evaluation of baseline and periodic data for the Group 3 performance monitoring wells (PMWs), as part of the revised performance monitoring plan (PMP). The revised PMP further described the specific statistical methods to be used for evaluating the Group 3 data. This memorandum evaluates data consistent with prior submittals and also using the statistical techniques described in the revised PMP, which is being reviewed by DEQ.

Group 3 PMWs

The data from the Group 3 PMWs continue to reflect the heterogeneous distribution of TCE and its degradation products, and resulting temporal variations. Consistent with the previous data submittal memoranda, a time-series chart of the geometric means of TCE, cis-1,2-DCE, VC, and chloride in the Group 3 PMWs (Figure 1) is attached. As shown on Figure 1, overall concentrations are declining in the downgradient portion of the plume, consistent with our understanding. The downward trend for chloride in Group 3 continues despite the increasing trend for chloride in the Group 2 PMWs as discussed in the previous data submittal.

As also discussed in the previous data submittal, an additional line of evidence for identifying the arrival of groundwater characteristic of 'treated water from the source area' is chloride. The continued lack of increasing chloride concentrations, which is the best indicator of the source area

fingerprint, in the Group 3 PMWs indicates that downgradient distribution of increased DPs as a result of the source area EIB implementation has not occurred.

The absence of elevated chloride concentrations in the Group 3 PMWs continues to suggest that concentrations of chloride (a conservative tracer) in the source area are attenuated before they reach the Group 3 PMWs. Attenuation will likewise reduce similar concentrations of DPs generated in the source area; further attenuation of the DP concentrations will occur due to sorption and dechlorination. Given that the DP concentrations appear to be declining in the source area and are attenuated more effectively than chloride, elevated DP concentrations as a result of EIB implementation are not expected to be observed in the Group 3 PMWs. Absent a coincident increase in chloride, fluctuations in TCE and DP concentrations in individual wells are therefore characteristic of the heterogeneous distribution of these chemicals as discussed in the previous submittal.

Consistent with the revised PMP and the previous submittal, nonparametric (Sen's slope estimator) trend analyses were run on the data to determine the existence and magnitude of monotonic trends in the data, as summarized in Table 1. Sen's slope estimator is a nonparametric test and is therefore more powerful for use in detecting and predicting trends in the dataset, as it is not necessary to make assumptions about the distribution of data. This method was used to detect trends consistent with the source area fingerprint (i.e., increasing chloride, decreasing TCE, and increasing cis-1,2-DCE and vinyl chloride).

Sen's method can be performed with moderate levels of non-detects, but is subject to the restriction that the number of non-detects must be less than $(n-1)/2$, where n is the total number of measurements. The data set met this criterion. A 95% confidence level was used to distinguish between statistically significant trends and statistically insignificant trends because of the unequal spacing of data.¹

The results of the Sen's test indicate that:

- An increasing trend for TCE was detected at well WS-24-111. No trends for cis-1,2-DCE, vinyl chloride and chloride were detected in this well. This pattern is not consistent with the source area fingerprint.
- An increasing trend for vinyl chloride was detected at well WS-21-131. No trends for TCE, cis-1,2-DCE and chloride were detected in this well. This pattern is not consistent with the source area fingerprint.

¹ Sen's method requires equally spaced data. Although samples were generally taken monthly, they were not taken on the same day and thus the estimate of slope that is calculated using Sen's method should not be used as an accurate estimate of the magnitude of a trend in the dataset. This method is also appropriate for use when the dataset does not exhibit seasonality. Currently, it is not possible to test for seasonality in the Group 3 PMWs since the bulk of the dataset only spans one year. Data series in which the mean concentration of an analyte in a well were below its RAO were not included in this analysis.

- An increasing trend for vinyl chloride was detected at well WS-21-112. No trends for TCE and cis-1,2-DCE were detected in this well. A decreasing trend in chloride was observed in this well. This pattern is not consistent with the source area fingerprint.
- An increasing trend for cis-1,2-DCE and vinyl chloride was detected at well WS-23-116. No trends for TCE and chloride were detected in this well. These patterns are likely the result of desorption from the manufactured gas plant-related dense, non-aqueous phase liquid (MGP DNAPL) observed in the well and are not consistent with the source area fingerprint.
- A decreasing trend for TCE was detected in well WS-25-96. No trends for cis-1,2-DCE, vinyl chloride, or chloride were detected in this well. This pattern is not consistent with the source area fingerprint.
- A decreasing trend for cis-1,2-DCE, vinyl chloride and chloride was detected in well WS-26-116. No trend was detected for TCE. This pattern is not consistent with the source area fingerprint.
- Decreasing trends for chloride were detected in WS-26-86 and WS-27-86, and a decreasing trend for vinyl chloride was detected in WS-26-86. No other trends were detected for the remaining analytes in these wells. This pattern is not consistent with the source area fingerprint.

Taken together, and consistent with the previous data submittal, the data from the Group 1, 2 and 3 PMWs continue to indicate that the full scale EIB implementation is successful and that additional contingency measures are not warranted using criteria identified by DEQ in their February 4, 2010 letter. This conclusion is supported by the following:

- The full scale implementation of enhanced *in situ* bioremediation in the source area has been effective for source removal, including TCE DNAPL presumed present by DEQ.
- Data from the source area are consistent with or outperform the EIB pilot study data.
- Data from the Group 3 PMWs are consistent with the pre-injection data from WS-21-112 with respect to variability and concentrations.
- Source area treatment has not resulted in increased concentrations of TCE degradation products in the Group 3 PMWs.
- Concentrations of TCE and its degradation products at the riverbank are declining. The Group 3 data, and specifically the critical line of evidence (chloride concentration data) do not support implementation of contingency source control measures for TCE and its degradation products.

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Attachments: Table
Figure
PMW Data file (electronic only)

cc: Tom McCue, Siltronic Corporation (electronic and hard copy)
Alan Gladstone, Davis Rothwell Earle and Xochihua (electronic and hard copy)
Chris Reive, Jordan Schrader Ramis (electronic and hard copy)
Jim Anderson, DEQ (electronic)
Kristine Koch, EPA (electronic)
Sean Sheldrake, EPA Seattle (electronic)
Rene Fuentes, EPA Seattle (electronic)
Eric Blischke, EPA Portland (electronic)
Chip Humphrey, EPA Portland (electronic)

Table 1
Summary Statistics for VOCs in Group 3 PMWs
Siltronic Corporation
Portland, OR

Compound	Number of Samples	Number of Detections	Mean	Minimum	Maximum	Standard Deviation	Sen's Slope Estimator	
							Slope	Trend
Trichloroethene (ug/L)								
WS-21-131	14	12	8.3	0.3 U	17.2	5.4	0.882083	None
WS-21-112	33	32	286.4	0.8	1900.0	445.8	-5.66667	None
WS-23-116	14	14	6.0	2.9	10.9	2.0	0.31225	None
WS-24-111	14	14	1127.1	1.1	1790.0	624	80	Increasing
WS-24-126	14	6	0.4	0.3 U	1.1	0.2	NC	NC
WS-24-155	19	0	ND	0.3 U	0.3 U	ND	NC	NC
WS-25-111	14	14	49.2	10.5	87.5	22.3	2.00347	None
WS-25-96	14	13	19.6	1.5	208.0	54.3	-0.80875	Decreasing
WS-26-116	14	5	0.4	0.3 U	1.0	0.2	NC	NC
WS-26-86	14	0	ND	0.3 U	0.3 U	ND	NC	NC
WS-27-86	13	3	0.3	0.3 U	0.5	0.1	NC	NC
cis-1,2-Dichloroethene (ug/L)								
WS-21-131	14	13	751.7	5.0 U	1700.0	484.6	55.27	None
WS-21-112	33	33	1794.4	91.4	10400.0	2558.8	-14.7727	None
WS-23-116	14	14	787.9	314.0	1790.0	394.5	63.4167	Increasing
WS-24-111	14	14	7576.9	666.0	16400.0	4494.7	259.444	None
WS-24-126	14	10	0.7	0.3 U	1.5	0.4	-0.059	None
WS-24-155	19	0	ND	0.3 U	0.3 U	ND	NC	NC
WS-25-111	14	14	1190.9	278.0	1760.0	466.3	-9.82143	None
WS-25-96	14	14	2198.6	230.0	3460.0	732.9	4.5	None
WS-26-116	14	13	21.1	0.3 U	250.0	66.0	-0.660556	Decreasing
WS-26-86	14	9	0.7	0.3 U	2.7	0.7	-0.03	None
WS-27-86	13	12	1.1	0.7	1.8	0.3	-0.005	None
Vinyl chloride (ug/L)								
WS-21-131	14	13	550	0.3 U	1350.0	391.7	53.5333	Increasing
WS-21-112	33	33	441.6	62.5	1570.0	373.9	13.08	Increasing
WS-23-116	14	14	152.3	80.9	314.0	69.5	10.4864	Increasing
WS-24-111	14	14	1422.8	45.0	2510.0	643.0	73.8393	None
WS-24-126	14	3	0.4	0.3 U	0.8	0.2	NC	NC
WS-24-155	19	0	ND	0.3 U	0.3 U	ND	NC	NC
WS-25-111	14	14	918.5	83.4	1550.0	386.8	2.27273	None
WS-25-96	14	14	933.4	25.9	1630.0	484.9	16.4889	None
WS-26-116	14	14	11.7	1.5	86.6	21.9	-0.716932	Decreasing
WS-26-86	14	13	2.6	0.3 U	8.9	2.4	-0.19033	Decreasing
WS-27-86	13	13	3.4	2.0	4.7	0.9	-0.0230357	None
Chloride (mg/L)								
WS-21-112	32	32	35.3	20.9	45.2	7.2	-0.6625	Decreasing
WS-21-131	13	13	45.8	22.2	62.7	9.5	-0.256667	None
WS-23-116	13	13	23.0	20.5	33.8	3.4	-0.0449495	None
WS-24-111	13	13	39.7	6.0	48.1	10.6	-0.1	None
WS-24-126	13	13	6.5	5.1	7.8	1.0	-0.108182	None
WS-24-155	15	15	29.5	16.9	85.3	17.2	-1.24286	None
WS-25-111	13	13	22.8	2.6	33.6	6.8	-0.152778	None
WS-25-96	13	13	19.4	17.3	27.9	2.9	-0.229167	None
WS-26-116	13	12	20.3	0.5 U	59.7	18.3	-2.35556	Decreasing
WS-26-86	13	12	16.9	0.5 U	28.4	6.2	-0.516667	Decreasing
WS-27-86	13	13	13.0	9.5	31.6	5.8	-0.391042	Decreasing

Note: Reporting limits (rather than one-half of the reporting limits) were used to calculate statistics.

U - not detected

NC - not calculated

Figure 1
Group 3 PMW Data
Siltronic Corporation
Portland, Oregon

